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ABSTRACT

Anthropologists and sociologists have found that technological innovators are more likely to find success when they: (1) recognize the group's unique identity; (2) assist the group in understanding and using the technology; (3) empathize with the group's environmental and cultural needs; and (4) empower the group to meet those needs. After reviewing related education literature, 12 questions (3 each for 4 factors) were established for considering how articles in the major research journals of the Association for Educational Communication and Technology (AECT) from 1953-1993 addressed issues that demonstrated an awareness of the teachers' culture in school. Of the 847 articles reviewed, 24% recognized the teachers' roles; 13% demonstrated an understanding of the teachers' working conditions; 15% provide specific explanations of how educational technology can be integrated into school structures; and 10% identified specific needs and corresponding educational technology solutions for empowering teachers. Recommendations made from this analysis include greater emphasis on teacher conditions and relevance in the research literature; articulation of how educational technology can be made effective within the schools' culture; and strategies for empowering teachers through educational technology resources. (Contains 30 references.) (Author/JLB)

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Title:

Empowering Teachers with Technology: An Agenda for Research and Development

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Abstract

Anthropologist and sociologist have found that technological innovators are more likely to find success when they: 1) recognize the group's unique identity; 2) assist the group in under-standing and using the technology; 3) empathize with the group environmental and cultural needs, and 4) empower the group to meet those needs. After reviewing related education literature, 12 questions (3 each for 4 factors) were established for considering how articles in the major research journals of AECT (1953-1993) addressed issues that demonstrated an awareness of the teachers' culture in school. Of the 847 articles reviewed, 24% recognizes the teachers' roles, 13% demonstrated an understanding of the teachers' working conditions, 15% provide specific explanations of how educational technology can be integrated into school structures and 10% identified specific needs and corresponding educational technology solutions for empowering teachers. Recommendations include greater emphasis on teacher conditions and relevance in the research literature, articulation of how educational technology can be made effective within the schools' culture, and strategies for empowering teachers through educational technology resources.

Humans are social. Much of our incentive for learning comes from interacting with and being recognized by others. Once the responsibility of parents, changes in the American family and society are shifting expectations for social development toward teachers. Teachers shape the instruction and activities in the classroom and they serve as role models for students. Many of the crucial contributions to social development, including those requiring mentoring and peer interaction, are too complex and situational to be fully integrated within machine-mediated instructional systems (Clark, 1984; Kerr, 1989; Martin & Clemente 1990). Even so, the systems employed by educational technologists (e.g., computers and multimedia) are playing increasingly significant roles in many aspects of American life from entertainment to business and education. These conditions call for strategies that capitalize on the potential of educational technology systems while at the same time recognizing the unique contributions that teachers make in meeting the social needs of learners.

Educational technologists differ in their opinions regarding the teacher's role in directing educational technology. Some educators (Aust, Allen & Bichelmeyer, 1989; Clark, 1984; Clemente & Martin 1990; Kerr, 1985) believe that teachers are capable and willing to contribute to the advancement of educational technology. While others (Heinich, 1984, 1985) believe that the use of educational technology should be directed by instructional systems managers with teachers serving as components in instructional systems. Issues concerning who should direct instructional systems development aside, research on change agents and school reform (Finn, 1990; Frymier, 1987; Goodlad, 1990; Grady, 1988; McDonald, 1989; Pearlman, 1988; Timar & Kirp, 1989) provides compelling evidence that innovations have a high degree of failure when teachers do no believe they are significantly involved in and empowered by the innovation (Maeroff, 1988).

To consider the evolution of these and other perspectives regarding teachers and educational technology, we conducted an initial review of literature in anthropology, sociology and education. This review was used to derive a series of questions for reviewing 847 articles that appeared in the major research journals of the Association of Educational Communication and Technology (AECT) from 1953 to 1993. Our intent is to uncover trends and insights for directing research and development agendas that engage teachers in the use and design of educational technology.

Cultural Awareness

In 1952 Edward Spicer explained "It has become something of a commonplace to say 'People resist change' but a generalization that has more facts to support it is the opposite 'People accept change'...." However, sociologists also note that once a group rejects innovation the chance that the group will reject further innovation increases markedly (Rogers, 1983). What can be done to limit the risks of introducing technological innovation to teachers? Many anthropologists (Spicer, 1952; Wolcott, 1981) believe that the answers can be found by carefully considering the culture of the receiving group before introducing technological innovation. Wolcott (1981) identified four reasons groups reject technological change:

1. Change appears to threaten basic securities.
2. The group does not understand the proposed technology.
3. The group perceive the innovators as outsiders and therefore resist the technology.
4. People do not vary customary behavior or tools unless they have a need for change.

Innovation rejection is not the only risk in introducing technological innovation to a group. An anthropological study of Yir Yoront, a tribe of Australian aborigines, exemplifies the negative impact that introducing technology can have on the receiving group's culture

(Blumenfeld, Hirschbuhl & Al-Rubaiy, 1979). In the Yir Yoront's isolated stone-age culture, the stone ax was a "privileged" symbol of authority used in elaborated trading practices (Sharp, 1952). When missionaries decided to widely distribute more effective steel axes, they seriously disrupted the social structure and traditions of the tribe. Attendance at traditional meetings and social functions decreased. Trade practices and rituals became chaotic and The Yir Yoront myths and beliefs were compromised. Because of the missionaries' haphazard innovation introduction, the Yir Yoront loss a significant part of their cultural identity and received no long-term benefits.

As defined in this article, "empowerment through technological innovation" is when a group of people addresses needs or receives benefits that cannot be met by current strategies or technology. Furthermore, a technology is "empowering" only when it satisfies this criteria without imposing significant negative effects on the group's culture. The above literature was used in deriving four categories to consider when introducing technological change into a culture. Innovators are more likely to be successful (or empowering) when they:
1) recognize the group's unique identity; 2) assist the group in understanding and using the technology; 3) empathize with the group environmental and cultural needs, and 4) empower the group to meet those needs.

Article Review Method

A total of 847 articles appearing in the professional journals of the AECT were reviewed, including: Audio Visual Communications Review (1953 - 1963), AV Communications Review (1964 - 1977), Educational Communications and Technology Journal (1978 - 1988) and Educational Technology Research and Development (1989-1993). After identifying the four basic factors for introducing change into a culture, we conducted a further review of education literature to derive the criteria for evaluating the AECT articles. This review included educational technology studies that were used to construct 13 items for applying the basic anthropological concepts specifically to the empowerment of teachers through educational technology. Three items were developed as indicators for each of the four factors. A question, concerning teachers being directed by instructional system design professionals, was also added in response to and extended dialog in AECT literature (Clemente & Martin, 1990; Heinich, 1984, 1985; Martin & Clemente, 1990; Shrock & Higgins, 1990).

A Hypercard data base was developed that included the journal name, title, volume, number, authors and year of publication. Each article appeared on a separate card. The thirteen items were listed as buttons. If an article included information that corresponded to one of the thirteen items, the appropriate button was clicked and the association between item and article was automatically recorded. Below are the thirteen items used to evaluate the articles. Each listing shows the question asked, the rationale for including the item, the criteria used, and an example for satisfying the criteria.

Recognition

The following questions concern how educational technologists can recognize teachers as primary users of educational technology and therefore cause teacher to feel more comfortable using the technological innovations.

1: Describes the teacher's role?

Rationale: Anthropologists (Wolcott 1981; Spicer, 1952) note that a receiving group rejects a technology when it threatens the group's basic securities. Similarly, Educational

Technologists (Heinich, 1984) found that some teachers will go so far as to sabotage educational resources that they find threatening. Consequently, teachers may find educational resources less threatening, if the developers recognize teachers as the receiving group of the technology.
Criteria: This item was checked if the article suggested (even briefly) teacher involvement with the technology.
Example: The article mentions teachers as users or observers of educational technology.

2: Explains to teachers how to use technology?

Rationale: Anthropologists state that a group of people feels less threatened by a technology if the use of a technology is communicated well (Blumenfeld, Hirschbuhl & Al-Rubaiy, 1979). Correspondingly, teachers may not accept technology, if they do not understand its use.
Criteria: This item was checked if teachers' use of the technology was clearly defined.
Example: The article describes how the technology is used by teachers as a record-keeping device, student evaluation, content presentation and/or lesson developing tool.

3: Explains how the technology will make the teacher more effective?

Rationale: Anthropologists found that a group feels acknowledged by a technologist, if he/she explains how the technology will make them more effective in their livelihoods (Rogers, 1983; Spicer 1952). Instructional designers also must describe how technology will make teachers more effective (Clemente & Martin, 1990).
Criteria: This item was checked if the article explained how teachers use of technology would make them better teachers.
Example: The article describes why using an instructional design could help a teacher to teach to specific curriculum objectives. The article explains several advantages of using an overhead projector in the classroom.

Empathy

As explained in both educational (Goodlad, 1990; Grady, 1988; McDonald, 1989) and anthropological (Wolcott, 1981; Blumenfeld, Hirschbuhl & Al-Rubaiy, 1979) literature, innovators are perceived as "outsiders" unless they demonstrate an understanding or "empathy for" the group's culture. As long as the group perceives the technologist as an outsider, the group will reject the technology. In like manner, teachers reject educational technology as an outsider's intervention, if the technologist does not appear to empathize with the "real-life" culture and environment of the teacher.

4: Describes how available the technology is for teachers?

Rationale: When change agents attempt to introduce a technology that is not currently available to a group, they also risk appearing as outsiders (Blumenfeld, Hirschbuhl & Al-Rubaiy, 1979; McDonald, 1989). This perceived lack of understanding and inconvenience can cause the receiving group to reject the technology. For example, teachers rejected early educational television programming because good programs were not available during convenient class times (Cuban, 1984).
Criteria: This item was checked if the article described clearly where and how teachers can gain access to the technology.
Example: The article describes how a teacher or administrator can obtain a book on a

particular instructional design. The author explains how many overhead projectors are currently available in most school districts.

5: Considers the teacher's workload?

Rationale: Anthropologists suggest that innovators will be considered outsiders, if they do not consider the environmental and cultural demands on the group (Wolcott, 1981). Teachers similarly are often on tight schedules that limit their ability to use technology (Bichelmeyer, 1992). Educational technology strategies are likely to be more accepted if educational techn-ologists make an effort to accommodate or lessen the teacher's workload.
Criteria: This item was checked if the article mentioned the daily tasks demanded by teachers and the time frame in which they have to complete these tasks.
Example: The article describes how lesson plans are demanded by most district and an instructional design is a simple method of satisfying these districts' demands. The author mentions something about accommodating class schedule. For example, the average classroom size in 1992 was more than 26 students and an overhead projector can present information easily to a group of 30 or more.

6: Describes how educational technology improves teacher/ student interactions?

Rationale: For most groups, social interactions and interconnectedness are the customs of their culture. If the innovation is perceived as threatening to a valued custom, the innovation will not be used (Spicer 1952). Likewise, one of the teacher's most valued customs is the one-on-one interaction with students. Teachers cite the disruption to student-teacher interaction as a reason for rejecting some instructional system design implementations (Martin & Clemente, 1990).
Criteria: This item was checked if the article explained how technology may reduce, increase or change the interac-tions between teachers and students.
Example: The author describes how the instructional design elicits students to ask more questions of a teacher. The article explains how the overhead projector increases students to be more reflective of their questions to the teacher.

Assistance

Anthropologists state a group rejects a technology if it does not assist them in performing valued task in their current environment. (Blumenfeld, Hirschbul, & Al-Rubaly, 1979; Rogers 1983; Spicer 1952). This assistance comes only after the group understands the technology thoroughly; the technologist considers the strategies the technology is replacing, and explains how the technology will be managed.

7: Explains teacher or pre-teacher training procedures?

Rationale: Anthropologists find that groups ignore technology, if it is not proven to assist the group is some manner. If a group contains a thorough understanding of the technology, they are more likely to recognize its helpfulness (Blumenfeld, Hirschbul & Al-Rubaly, 1979; Rogers 1983; Spicer 1952). Training is one of most effective means of guaranteeing this understanding. Teachers are less likely to adopt innovation if they believe that the training is inadequate (McCombs, 1985).
Criteria: This item was checked if the article described the process for conducting training in the use and benefits of the technology.
Example: The author mentions instructional design courses that are now being offered

at teacher-education colleges. The article describes a successful workshops for training in the use of educational technology.

8: Describes the relationship to existing strategies and structures?

Rationale: In anthropology, a group ignores an innovation if the traditional methods of the group are not acknowledged and protected. In addition, change will not be accepted if advantages over traditional strategies are not proven and observable (Blumenfeld, Hirschbuhl & Al-Rubaiy, 1979 Rogers, 1983; Wolcott, 1981). Teachers will reject replacement technology, if it is not proven more helpful than the methods they are currently using (Martin & Clemente, 1990).
Criteria: This item was checked if the article described how the technology will augment current teaching practices, or describes how the technology will prove more effective than current teaching methods.
Examples: The author explains how the instructional design does not replace the control and flexibility of the teachers in directing instruction. The article explains how teachers can use an overhead projector more effectively and explains how teachers might replace some blackboard functions with an overhead projector.

9: Explains approaches for managing and organizing media?

Rationale: A technology may not be perceive as helpful if the effort involved in managing and organizing its use is unreasonable. Teachers do not want to become overburdened by the bureaucracy of instructional management (Kerr, 1989).
Criteria: This item was checked if the article described who is responsible for or how the technology will be stored, organized, maintained and/or evaluated.
Example: The author explains who should be responsible for the maintenance and repair of overhead projector or the evaluation of an instructional design.

Empowers

Many anthropologists feel that the purpose of any technology is to empower the group. Empowerment (as used here) means not only acceptance of the technology, but personalizing it so each individual in the group can modify the technology to varying situations.

10: Explains how the teachers can select, control or modify technology?

Rationale: Anthropologists believe that, especially during the early stages, user should be offered considerable control and practice in implementing technology (Rogers 1983). Teachers express that they are willing to become involved in the implementation of innovations (Aust, Allen & Bichelmeyer, 1989).
Criteria: This item was checked if the article described the procedures for a teacher to use in modifying or selecting technology to fit their personal class-room environment.
Example: The author explains how a teacher can use an overhead projector in varying degrees of classroom light. The article describes how to select an instructional design that can be used for both lesson and long-range course planning.

11: Describes strategies for administrators to support teacher use of technology?

Rationale: Anthropologists have found that individuals in a group will adopt the innovation more rapidly if the adoption power is more 'equally distributed' (Freeman, Azadi,

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1983). Teachers as well, may reject a techn-ology unless control of the technology is given directly to teachers not the school administration (Cuban, 1984).
Criteria: This item was checked if the article explained how administrators can be involved in distributing the control of educational resources to teachers.
Example: The author explains how the use of educational technology can be controlled by teachers. The article describes how teachers are involved in evaluating an instructional design.

12: Describes teacher's involvement in the innovation and planning?

Rationale: Studies in anthropology (Spicer 1952; Rogers, 1983) explain that the chance for empowerment through a new technology increases if the receiving groups are closely involved in the development cycle. Teachers moreover, are resistant to reforms that rely on "outside" change agents unless they have are sufficiently involved in the reform (McDonald 1989; Sirotnik & Clark, 1988; Timar & Kirp 1989).
Criteria: This item was checked if the article described how teachers are involved directly or indirectly in the development of the technology.
Example: The author explains how the complaints of blackboard dust by teachers were considered in the innovation of overhead projectors. The article describes how an instructional design was developed by a committee consisting of secondary school teachers.

Teachers in Roles Secondary to Instructional System Design (ISD) Specialists.

13. Casts teacher as inflexible or in a secondary role?

Rationale: Studies in both educational technology and anthropology have note that many technologists blame the receiving group when a technology fails (Wolcott, 1981). Such conceptions may increase chances that future technology introductions will be rejected.
Criteria: This item was checked if the article described the teachers' function in terms of an overall plan under the direction of an instructional system designer or administrator. This item was also checked if the article described teachers as unresponsive or inflexible.
Example: The article describes the teacher as a monitor in a fully-mediated classroom. The author explains that instructional planning should be performed exclusively by professional instructional designers.

Review of AECT Journals

Analysis of the data collected from the 847 articles appearing in AECT journals was intended to reveal the relative emphasis placed on factors relating to teacher's involvement in educational technology. Hypertalk routines were developed to automatically tabulate the data entered by the reviewer. Results are shown as percent of articles that met criteria for each item. Charts were constructed using Microsoft Excel.

Limitations:

This is an exploratory investigation designed to gain general insights and refine procedures. Efforts were made to maintain objectivity in reviewing all articles. However, the review of the articles was conducted by one reviewer, and inter-rater reliability has not been established. Once inter-rater reliability is established, more involved statistical procedures including correlation across factors may be warranted.

Table 1
Percent of Articles that Address Teacher Related Issues in
AECT Research Journals (1953 - 1993)

Recognition	26%
1: Describes the teachers role?	24
2: Explains to teachers how to use technology?	14
3: Explains how the technology will make the teacher more effective?	17
Empathy	13%
4: Describes how available the technology is for teachers?	4
5: Considers the teacher's workload?	5
6: Describes how educational technology improves teacher/student interactions?	12
Assistance	14%
7: Explains teacher or pre-teacher training procedures?	5
8: Describes the relationship to existing strategies and structures?	12
9: Explains approaches for managing and organizing media?	5
Empower	10%
10: Explains how the teachers can select, control or modify technology?	8
11: Describes how administrators can support teacher use of technology?	1
12: Describes teacher's involvement in the innovation and planning?	5
13: Casts teacher as inflexible or in a secondary role?	3

Note: 874 articles were analyzed

This table shows the percent of articles that met the criteria for each item. Factor headings (e.g. Recognition) show the percent of articles that satisfied criteria for one or all of the three items associated with that factor.

Figure 1
Teachers Recognized and Teachers as Secondary to ISD

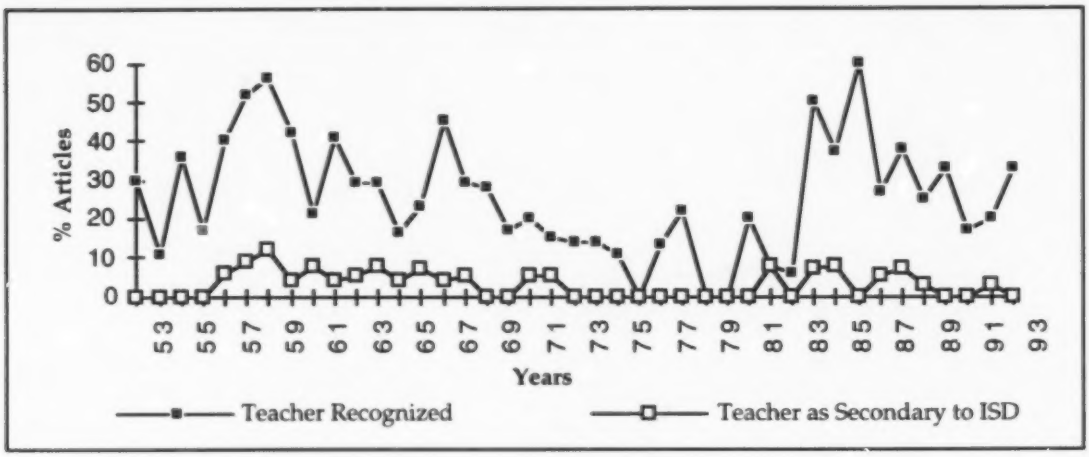

Figure 1 shows the percent of the 847 AECT articles (by year) that satisfied the criteria for the Teacher Recognition and Teacher as Secondary to ISD factors. If and article was deemed as satisfying the Teacher Recognition criteria, the reviewer must have answered yes to at least one on the following three questions: This article describes the teachers role? (and/or) This article explains to teachers how to use technology? (and/or) This article explains how the technology will make the teacher more effective? To satisfy the Teacher as Secondary to ISD criteria the reviewer must have answered yes to the question: This article casts teacher as inflexible or in a secondary role? Note that the peaks in the Teacher Recognition factor appear slightly after the peaks in the Teacher as Secondary to ISD factor.

Figure 2
Empathy for Teacher Needs

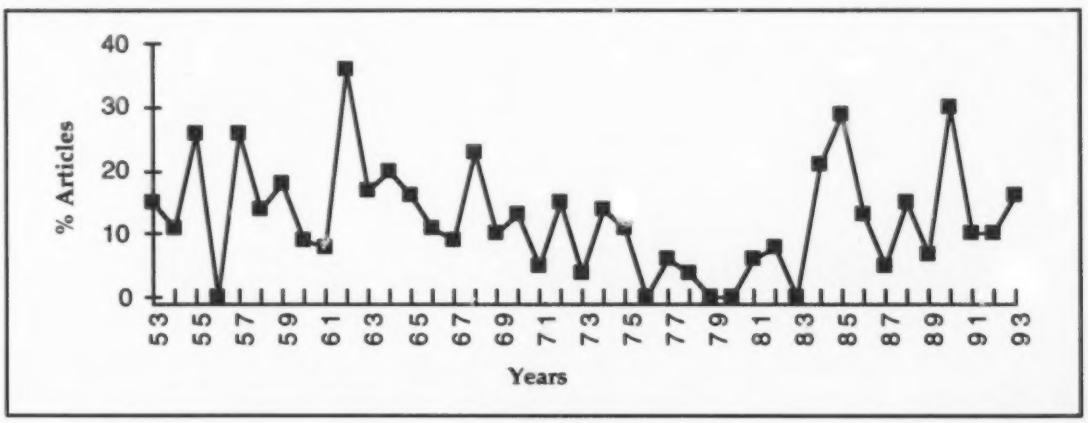

Figure 2 shows the percent of the 847 AECT articles (by year) that satisfied the criteria for the Teacher Empathy factor. If an article was deemed to meet this criteria, the reviewer had answered yes to at least one on the following three questions: This article describes how available the technology is for teachers? (and/or) This article considers the teacher's workload? (and/or) This article describes how educational technology can improve teacher/student interactions?

Figure 3
Describes Teacher Assistance

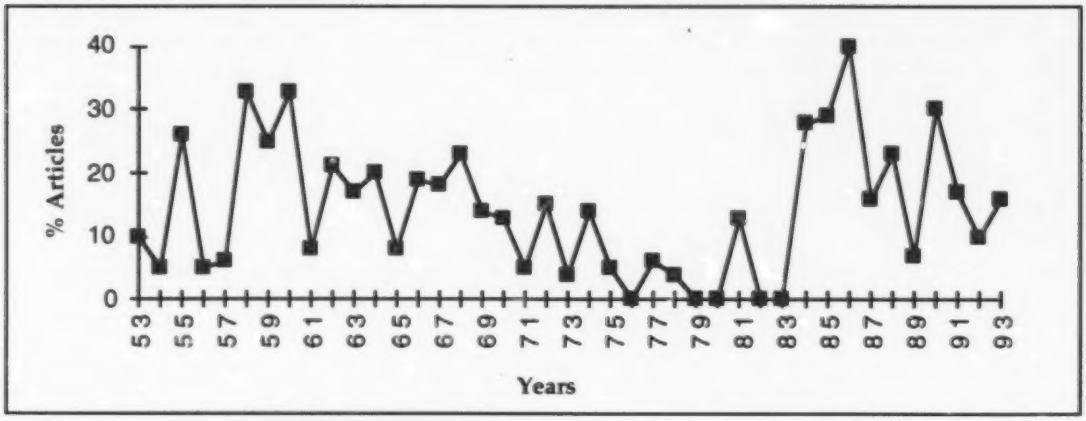

Figure 3 shows the percent of the 847 AECT articles (by year) that satisfied the criteria for the Teacher Assistance factor. If an article was deemed to meet this criteria, the reviewer had answered yes to at least one on the following three questions: This article explains teacher or pre-teacher training procedures? (and/or) This article describes the relationship to existing strategies and structures? (and/or) Explains approaches for managing and organizing media?

Figure 4
Teacher Empowerment

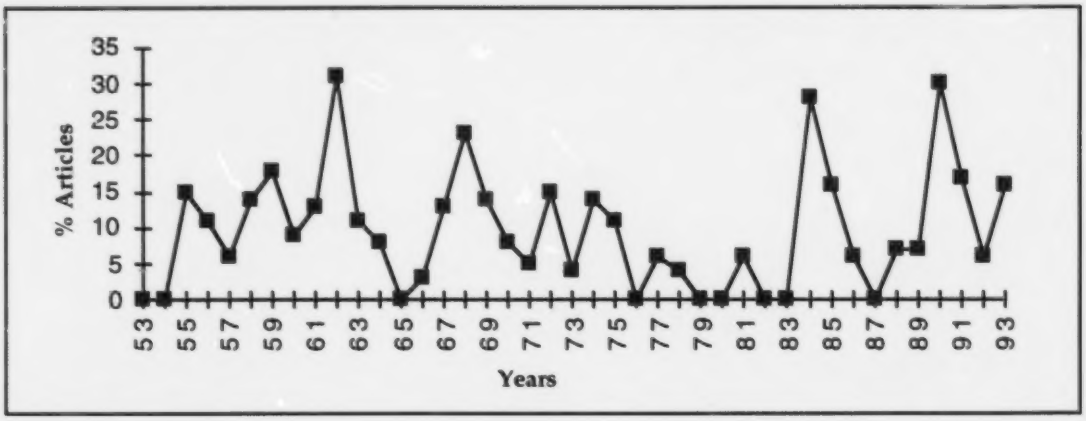

Figure 4 shows the percent of the 847 AECT articles (by year) that satisfied the criteria for the Teacher Empowerment factor. If an article was deemed to meet this criteria, the reviewer had answered yes to at least one on the following three questions: This article explains how the teachers can select, control or modify technology? (and/or) This article describes how administrators can support teacher use of technology? (and/or) This article describes teacher's involvement in the innovation and planning?

Discussion

Much of the literature in the AECT research journals focuses on the effects of mediating learning with technology. About a quarter of the articles (24%) do at least recognize the teachers' roles (see Table 1). However, the other factors concerning teachers' conditions in schools, have not received substantial attention in educational technology research and development. Only about 13% of the articles mentioned issues that demonstrate an understanding of the teachers' working conditions in schools. Fewer than 15% provide specific explanations of how educational technology can be integrated within existing curriculum or related school structures. Finally, about 10% identified specific needs and corresponding educational technology solutions for empowering teachers.

As the Yir Yoront discovered, the desirability of technology is relative to cultural values. Teachers are the first-line receivers of educational technology and this review indicates that educational technologist may not be paying enough attention to the teachers' culture. One risk is that educational technologist will appear as outsiders who, even with superior technology, will be summarily ignored by many teachers. A more consequential concern is that zealous efforts to widely demonstrate educational technologies without considering cultural implications, may be disruptive of both the culture within schools and society at large.

The review of the AECT articles also reveals patterns in the amount of attention paid to teacher issues. Figures 1- 4 show somewhat tandem cycles with the four teacher factors (recognition, empathy, assistance and empowerment) peaking in the early 1960s and mid 1980s. We do not have a single compelling explanation for these cycles. Note in Figure 1 that the peaks in the percent of articles that cast teachers as inflexible or in secondary roles appear just ahead of the peaks in teacher recognition. One explanation is that the peaks and

valleys represent reaction to specific events that question sensitive issues related to either teachers or technology. For example, Robert Heinich published and article in 1984 explaining that teachers could be considered as components in ISD. Several authors (Clemente & Martin, 1990; Heinich, 1984, 1985; Martin & Clemente, 1990; Shrock & Higgins, 1990) followed with articles that cited Heinich and often presented contrary positions. Possibly, Heinich's article spawned this extended debate but there may have been any number of reasons for the rise in attention paid to teacher issues. The cycles might be a reaction to national agendas such as the reform movement, the Holmes group movement, federally funded initiatives or possibly they reflect the preferences of the editorial boards. More in depth reviews of the literature are needed to better understand and interpret these cycles.

Recommendations

The most far-reaching means for addressing teacher issues in educational technology may be a comprehensive plan for encouraging research authors to relate findings to the needs of teachers. This would not require extensive changes in the research designs or compromises in essential basic research. Instead, authors would more explicitly describe how their existing research relates either directly to the needs of teachers or how the research could lead to better understanding of teaching and learning. Of course, AECT has other literature (e.g., Tech Trends) that is intended to describe advances in and practical uses of educational technology. However, the notion that there are different "levels" of literature for different levels of audiences promote a counter productive isolationist image that deters teacher involvement. A more reasoned approach is to provide different forms of literature with different purposes that continue to maintain broad audience appeal.

Much of the current research and development concerning educational technology focuses on strategies for perfecting the interaction between learners and machines. Research addressing such issues as feedback, graphics, hypertext, integrated learning systems, cognitive styles, learner control and pacing, is needed to assist designers in refining instruction. However, such research should not overshadow questions concerning teacher empowerment with educational technology. Do teachers consider their culture as different and separate from the educational technologists -- what are the differences? How can machines improve the interaction between students and teachers? Is educational technology meeting the teachers' real-world needs for curricula and other support? Which teaching activities are best handled by technology and which are best left to teachers? How can administrators best serve to empower teacher with educational technology?

Developers of educational technology can address teacher empowerment by providing greater teacher control of the characteristics of educational resources. For example, computer instructional programs can provide overriding teacher control of feature such as: level of difficulty, amount of remediation, time, pacing, graphics and audio. Teachers (possibly in consultation with students) could then determine the most appropriate combination according to their understanding of the learner, the curriculum and current classroom conditions. In this way the resource is optimized through the teachers unique skills in mediating the complex learning situations and the mentor role of the teacher is maintained. Developers should also address teacher needs by providing guides that explain such concerns as the process skills addressed, required pre-requisites, intended grade level and consistency with curricula .

Educational technology can empower teachers by incorporating social enrichment activities within instructional systems. The Jasper Woodbury series developed at Vanderbildt University provides an example of this form of empowerment. Several of the Jasper Woodbury segments begin by using video to establish a problem solving scenario and

then encourage students to break into groups for data analysis and forming hypotheses. During these group discussions the students have an opportunity to interact with peers while the teacher's role in moderating the group and directing learning is maintained.

Advances in computer networks can also be used to address teacher empowerment through improved communications among teachers and community publishing of information services. Computer and networking technologies are advancing rapidly as government officials and private industry seek to establish a National Information Infrastructure (NII). This is a critical period for educators to become involved in demonstrating ways the NII can empower teachers and learners. One such strategy is through the development of national conferencing capabilities for a variety of teaching specialties. Using currently available technology this would involve establishing special interest bulletin boards and providing broad accessibility to schools so that teachers that share common goals but are separated by geographical and scheduling barriers can easily exchange ideas for improving teaching. As the networking and multi-media technologies advance, teachers will be able to demonstrate and monitor the on-going work of exemplary teaching.

Another example of network technology empowering teachers is the community publishing of network-based educational resources (see for example; Aust, 1993, 1992). Most teachers have a repertoire of successful teaching skills but neither the time or support for publishing extended collections. Network information services are capable of automating the processes of contributing and organizing information so a teacher can contribute a single resource (lesson plan, lab activity or field trip description) that becomes part of a large resource data base that may eventually be easily searched from any school in the nation. In this way, the teacher will contribute to libraries of educational resources while becoming vested in the goal of empowering all teachers.

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